ENGINEER/DEVELOPER DESIGN HANDBOOK
FOR
PUBLIC WATER FACILITIES

City of Riverside
Public Utilities Water Division

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1.0 INTRODUCTION

The City of Riverside Public Utilities Water Division is a municipal utility with the mission of providing water supply and water resource management to the public in a safe, reliable, environmentally sensitive, and financially responsible manner.

1.01 PURPOSE

This manual was developed to guide Developers and their Engineers through the process of design and construction of new public water facilities. The included information is pertinent to tract development and commercial buildings. If, after utilizing this handbook, you have any questions or comments regarding the contents, please contact Development Services at (951) 826-5285.

1.02 GENERAL

Within the Design Manual, the term "Water Division" means City of Riverside Public Utilities Water Division. "Developer's Engineer" means a currently licensed Registered Civil Engineer retained by the Owner or Developer to perform engineering for water systems in conjunction with land division development. "City" means City of Riverside.

The Water Division provides water service to properties located within the City of Riverside service area. If customers are outside the existing service area, they may be able to obtain service by annexing into the City or by seeking service from other nearby Public or Private Utility. Water Division should be consulted for advice regarding service in any of the above circumstances.

Water facilities include water pipelines, related appurtenances, and may include offsite facilities such as booster stations, water storage reservoirs, and pressure regulating stations that are necessary to deliver sufficient water at adequate volume and pressure to the development.

If water service is desired within the existing service area, service can normally be provided if the Developer meets the following conditions:

1. Designs, constructs, and dedicates to Water Division the necessary facilities. The Water Division will review all plans, and may revise, modify or request the redesign of any concepts, plans or details submitted. All plans must be approved and signed by Water Division prior to the issuance of a Construction Permit.
2. Grants fee title parcels and/or easements to Water Division on City prepared deed forms for all facilities not located within public right-of-way. Water facility easements shall be a minimum of 30 feet in width unless otherwise approved by the Water Division.
3. Pays current applicable fees in addition to completing the requirements listed above. Fees may include: Plan Check Fees, Connection Charges, Inspection Fees, Added Facilities Charges, Elevation Fees, Front Footage Charges, Service Connection Fees, Meter charges and Distribution System Fees. Water Division should be consulted for current and applicable fees.

The procedures for the development of water systems for Tract Map, Parcel Map, and Single Lot development differ only slightly. The design standards contained herein are primarily prepared for Tract

Map development, but can be used for all three types within the City of Riverside. The applicable minimum requirements are as follows:

- Design required facilities to Water Division's standards.
- Prepare water plans. Water Division has the authority to waive this requirement for single lot developments.
- Water Division's staff reviews and approves plans.
- Dedicate right-of-way for all facilities to be owned and operated by Water Division.
- Pay all necessary fees.
- Post bonds with Water Division, retain a qualified licensed Contractor, and provide proof of insurance.
- Fund and obtain inspection services by Water Division.
- Obtain a written "Notice to Proceed" before construction begins.
- Have an engineer certify that the proposed final road grade (as shown on the plans and approved by the City of Riverside Public Works Department) over the pipeline alignment has been achieved. If the existing surface of the alignment is not to be changed, it will be necessary to so certify.
- Construct facilities to Water Division's standards.
- Water Division's staff provides final approval of facilities constructed.
- Submit "as-built" plans (field changes recorded on prints of approved Plan) to Water Division.

For Water Division facilities outside of the Riverside City Limits, the following additional requirements are required:

- Submit plans to the applicable Riverside County departments for their review and approval. Signature blocks to be added to the cover sheet.
- Agreement for Construction, between the Developer and Water Division, to be executed prior to plan approval.

All costs will be the responsibility of the Developer.

1.03 OTHER PUBLIC AGENCY REQUIREMENTS

The requirements for water plan design for public water facilities specified herein do not waive nor are they intended to contradict any requirements of other legal governing public agencies.

Engineers designing water systems for inclusion in Water Division's system must be knowledgeable of and comply with the regulations of the State of California, the County of Riverside, the City of Riverside, or any other local agency having jurisdiction. These shall include Administrative Codes, Civil Codes, and Health Regulations.

1.04 WATER PLAN APPROVAL PROCESS

The Developer's Engineer must design the facilities and prepare the construction drawings (water plans) to Water Division's standards. Water Division will review all water plans and may revise, modify, or require redesign of the drawings, or details submitted. Once the water plans have been approved by the Water Division, the Developer has one year, from the approval date of the plans, to start construction. If more than one year has elapsed, the water plans will be voided and the project must go through a new plan check procedure before any construction can start. The steps required to obtain water plan approval are as follows:

1. Attend A Preliminary Planning Meeting.

   This meeting is strongly suggested but is not a requirement. The Developer shall call the Water Division at 951-826-5438, to arrange a preliminary planning meeting to discuss the proposed project. At the preliminary planning meeting, submit a tentative tract map, or project site map with the preliminary water facilities shown. Upon review of the project, Water Division may require a preliminary hydraulic report and/or hydraulic network analysis.

   Water Division will discuss the general location and size of required facilities as well as provide information on known existing Water Division facilities in the area. If available, Water Division will provide as-built plans for existing facilities.

2. Submit Preliminary Hydraulic Report and/or Hydraulic Network Analyses (if required).

   If required, the preliminary hydraulic report and hydraulic network analyses must be submitted to Water Division for review and comments. The preliminary hydraulic report and/or hydraulic network analyses must be approved prior to submittal of any drawings for plan check. Once Water Division and the Developer's Engineer have agreed on a conceptual design, detailed plans may be prepared and submitted.

3. Submit first plan check with plan check fee.

   The normal Plan Check base fee is $45 per lot with a minimum fee of $450. The submittals for first plan check shall consist of the following:

   1. Two copies of the water construction plan.
   2. One copy of the street improvement plan.
   3. One copy of the grading plan.
   4. One copy of the storm drain plan.
   5. One copy of the sewer plan.
   6. Two copies of tentative Tract/Parcel Map.
   7. One copy of Tract Phasing Map (including lot numbers and street names).
   8. One copy of the Soil Report.

   Submittals must be complete or they will be rejected. Each submittal shall include a transmittal listing all items submitted. Details regarding design criteria are included in Section 2.0. Details regarding preparation of plans are included in Section 3.0.

The Water Division's goal for the first plan check is 20 working days. The Water Division strives to meet these goals but the plan review time can vary depending on the number of plans in the review process, size of project, complexity of the plans, and the completeness of the plans. Water Division will provide comments on one set of the water plans and return them to Developer's Engineer for revisions. In addition, the Water Division will provide a copy of plan Check Required Item Checklist listing all required submittals.

After the first set of check prints are returned, no changes except those requested or approved by Water Division shall be made by the Developer's Engineer. If the Developer's Engineer wishes to make a change other than that requested by Water Division, a print marked with the proposed change in red pencil shall be submitted for approval. Only after written approval shall the original be changed. The authorized change shall be highlighted on the next recheck submittal. **Drawings that do not follow the requirements contained in the Design Manual and/or that are unclear, misleading, or confusing will be subject to rejection without review**.

4. Submit subsequent plan checks.

   For each subsequent plan check, Developer's Engineer must submit the following:

   - All previous Water Division plan check sets.
   - Two copies of the revised construction drawings.
   - Any additional material requested.

   Submittals must be complete or they will be rejected. If the drawings are not yet satisfactory, Water Division will make comments on one set of the drawings and return same to Developer's Engineer for revisions. This procedure will be repeated as necessary until the drawings are acceptable. If Developer's Engineer does not return the previous Water Division plan check sets, the plan check procedure will start from the beginning.

   Water Division's goal is to complete all subsequent plan checks within 10 working days of receipt of a complete submittal. Plan review time may vary depending on the number of plans in the review process, size of project, complexity of plans, and completeness of plans.

5. Submit final Plans for approval, and all items required per Section 1.05

   After all plan checks are completed and the plans are acceptable to the Water Division, the original mylars must be submitted to Water Division for signature. Prior to final approval of the construction drawings, the Developer must pay all required fee's and meet the required items on "Plan Check Required Item Checklist" (Section 1.05).

6. Water Division Signs Plans.

   Once all submittals have been completed to Water Division's satisfaction, the mylars will be signed. The Developer's Engineer is required to obtain signatures from all other agencies and provide Water Division with the original mylars and 2 sets of prints. Original water plan mylars become the property of the Water Division. Water Division will furnish the Developer with the pre-construction requirements.

Once signed, the originals cannot be modified without written permission from Water Division's Principal Engineer. Any modification after signing shall be noted in the plan's revision block.

Plans checks resubmitted after one year, regardless of number of previous submittals, will be deemed "expired". "Expired" plan checks resubmitted will be subject to Water Division's current Water Division design requirements, including the plan check fee, and considered a "first plan check submittal".

2.0 DESIGN CRITERIA
FOR WATER DISTRIBUTION SYSTEMS

Water system improvements proposed for inclusion into Water Division's service area shall be designed in accordance with all appropriate AWWA standards and the following criteria:

2.01 SYSTEM DEMAND CRITERIA

The Water Division reserves the right to determine criteria for each water system or sub-system based upon conditions that may exist for that particular location, anticipated level of development, planned use or other criteria.

Specific fire flow requirements shall be determined by the Water Division using the recommendations of the Fire Department. Fire flows for most areas will generally fall within the following limits:

Single Family Residence w/sprinklers	500 gpm @ a minimum 20 psi
Single Family Residence wo/sprinklers	1000 gpm @ a minimum 20 psi
Multiple Residential & Condominiums	1500 gpm @ a minimum 20 psi
Commercial	1750 - 8000 gpm @ a minimum 20 psi
Industrial	1750 - 8000 gpm @ a minimum 20 psi

Commercial and industrial development requirements shall be analyzed separately based on the specific proposed project.

Water distribution pipelines to all service areas shall be looped to provide dual direction supply and system flexibility. Dead end mains are undesirable, but can be considered on a case-by-case basis.

2.02 SYSTEM ANALYSIS

The proposed water system shall be analyzed, if requested by the Water Division, for the following three conditions:

1. Peak hour demands with booster pumping plants on.

   For the peak hour demand flow analysis, the pressure at each node shall be a minimum of 40 psi and a maximum of 125 psi.

2. Maximum day demand plus fire flow with booster pumping plants off.

   For the maximum day demand plus fire flow analysis, fire flow should be selected for the worst-case scenario (typically the hydrant furthest from the connection(s) to Water Division's distribution system, at the highest system elevation) and as directed by Water Division's staff. The pressure at each node shall be a minimum of 20 psi and the maximum velocity in the pipelines shall be 10 feet per second.

3. Minimum hour demands with wells and boosters on.

   For the minimum hour demand analysis, the maximum velocity in the pipelines shall be 6.0 feet per second and the maximum pressure at each node shall be 125 psi.

The Developer's Engineer will be required to submit an analysis of anticipated flow demands; average, maximum hour flow, and maximum day plus fire flow. Water Division shall accept or modify the submitted analysis.

2.03 WATER PIPELINE SIZING CRITERIA

In residential zones, an 8-inch (I.D.) diameter D.I.P. line shall be the minimum standard size for water mains. A 4-inch D.I.P. may be used in single family residential cul-de-sac streets, not requiring fire hydrants and serving not more than 10 services.

For commercial and industrial zones, the minimum standard pipeline size shall be a 12-inch (I.D.) D.I.P. Larger size pipelines may be required to meet Fire Department flow requirements and/or high development flows. The zoning designations, per the City of Riverside Planning Department, for commercial districts are RO, CO, C-1, C-1-A, CL, C-2 and C-3. The zoning designations for industrial districts are MP, M-1, M-2, WC, RWY and AIR.

Water Division reserves the right to specify sizing of any water pipeline. Due to master planning, Water Division may require a larger size pipeline than normally required for a particular project to satisfy Water Division's design standards for system distribution requirement purposes. Water Division's Board of Public Utilities may authorize participation and payment of increased cost of such water pipeline in accordance with Water Division's criteria.

2.04 PIPELINE STRENGTH

All water mains 12-inches and under shall be Class 350 D.I.P. per A.W.W.A. C-151. Pipes over 12-inches shall be determined as follows:

1. Internal pressures shall be calculated from the maximum working pressure expected on the pipe. No allowance need be made for water hammer in the distribution system analysis. Pumping suction and discharge lines shall be investigated as to water hammer under conditions of power failure at full flow. In general, pressures for each zone may be calculated from the following table:

PRESSURE ZONE	ELEVATION OF MAXIMUM WATER SURFACE
925	975'
Gravity (997)	1000'
1010	1060'
1040	1090'
1100	1150'
1200	1250'
1300	1350'
1400	1450'
1600	1650'

For pressure zones other than those listed, contact Water Division for the elevation of the maximum water surface.

2. External loads shall be designed to withstand the weight of the earth cover plus live loads based on the application of a H-20 truckload, using appropriate impact factors, which recognize depth of pipe, plus a safety factor of 1.5.

2.05 WATER PIPELINE LOCATION

Unless otherwise approved by Water Division, all water pipelines shall be located on the southerly or westerly side of the street, with the centerline of the pipe 8 feet from the street centerline. The location shall not interfere with other existing or planned utilities or proposed street improvements.

The cover over the water pipeline shall be sufficient to provide protection to the pipeline and for the operation of the appurtenances. The depth for 8-inch diameter and under pipelines shall be 3.0 feet from the ground surface (pavement, graded travel way, or open ground) to the top of the pipeline. For pipelines 12-inches and larger, the depth shall be 4.0 feet to the top of the pipeline. These depths may be increased or decreased by the Water Division, as necessary, to cover non-standard conditions. Minimum slope of water pipelines shall be 0.2 percent unless otherwise authorized by Water Division.

Water main separations shall be governed by CWD-015 and the following rules:

1. Installation of sewer pipe and water mains shall **not** be located within the same trench.

2. Water mains shall be installed with a minimum horizontal separation of 10 feet outside of pipe to the outside of pipe (hereafter shown as (O.O.)) from, and with a minimum vertical separation of 1 foot (O.O.) above, any parallel pipeline conveying:

    (a) Untreated sewage,

    (b) Primary or secondary treated sewage,

    (c) Disinfected secondary – 2.2 recycled water (defined in Title 22 CA Code of Regulations, Section 60301.220),

    (d) Disinfected secondary – 23 recycled water (defined in Title 22 CA Code of Regulations, Section 60301.225), and

    (e) Hazardous fluids such as fuels, industrial wastes and wastewater sludge.

3. Horizontal separation of less than 10 feet (O.O.), but greater than 5 feet (O.O.), requires the approval of the Water Division and the use of special construction methods outlined herein. Horizontal separation of less than 5 feet (O.O.) for gravity sewers and 10 feet (O.O.) for sewer force mains is prohibited.

4. Water mains shall be installed with a minimum horizontal separation of 4 feet (O.O.) from, and with a minimum vertical separation of 1 foot (O.O.) above, any parallel pipeline conveying:

    (a) Disinfected tertiary recycled water (defined in Title 22 CA Code of Regulations, Section 60301.230), and

    (b) Storm drainage.

5. If crossing a pipeline conveying a fluid listed in paragraph 2 or 4, above, a new water main shall be constructed perpendicular to and at least 1 foot above that pipeline. No connection joints shall be made in the water main within 8 horizontal feet of the fluid pipeline.

6. The vertical separation specified in 2, 4 and 5 above is required only when the horizontal distance between the water main and a pipeline is 11 feet of less.

7. All separations referred to herein are either horizontal or vertical distances, which are measured at right angles to the water main. Crossing at less than a 45-degree angle will not be permitted.

8. Details of water main/sewer pipe conflicts involving special construction methods for greater than 12-inch diameter pipelines shall be shown on the Plans.

9. Where sewer is referred to herein, it shall be interpreted as sewer main or sewer lateral. This also applies to Water Division Standard Drawings CWD-020, CWD-021, CWD-022, CWD-023 and CWD-024.

10. When a new sewer force main crosses under an existing water main, all portions of the sewer force main within 10 feet horizontally of the water main, shall be enclosed in a continuous pipe casing, per Water Division Standard Drawing CWD-023, Type A.

11. When a new water main crosses over an existing sewer force main, the water main shall be constructed of pipe materials with a minimum rated working pressure of 200 psi or an equivalent pressure rating.

2.06 ALTERNATIVE CRITERIA FOR PIPELINE CONSTRUCTION

When existing conditions dictate the installation of water mains, sanitary sewer mains, storm drain mains or other non-potable pipelines at separation distances less than that required above, alternative construction criteria may be approved by the Water Division. Water Division Standard Drawings CWD-015-1 and CWD-015-2 show alternative construction criteria for two different cases where the regulatory criteria cannot be met.

Case 1: New sanitary sewer main and a new or existing water main. Alternative construction criteria apply to the sanitary sewer main.

Case 2: New water main and an existing sanitary sewer main. Alternative construction criteria may apply to either or both the water main and sanitary sewer main.

Case 1 – New Sanitary Sewer Main Installation (CWD-015-1)

Zone	**Special Construction Required for Sanitary Sewer Main**
A	Sanitary sewer mains parallel to water mains shall not be permitted in this zone without prior written approval from the Water Division.
B	If the water main paralleling the sanitary sewer main does not meet the Case 2, Zone B requirements, the sanitary sewer main should be constructed of one of the following:

1. Extra strength vitrified clay pipe with compression joints;
2. Cast or ductile iron pipe with compression joints; or
3. PVC sewer pipe with rubber ring joints (per ASTM D3034) or equivalent.

C If the water main **crossing below the sanitary sewer main** does not meet the Case 2, Zone C requirements, the sanitary sewer main should have no joints within 10 feet from either side of the water main (in Zone C) and should be constructed of one of the following:

1. A continuous section of ductile iron pipe with hot dip bituminous coating; or
2. One of the Zone D options 2, 3, or 4 below.

D If the water main **crossing above the sanitary sewer main** does not meet the Case 2, Zone D requirements, the sanitary sewer main should have no joints within 4 feet from either side of the water main (in Zone D) and should be constructed of one of the following:

1. Ductile iron pipe with hot dip bituminous coating and mechanical joints (gasketed, bolted joints);
2. A continuous section of Class 200 (DR 14 per AWWA C900-97) PVC pipe or equivalent, centered over the pipe being crossed;
3. A continuous section of reinforced concrete pressure pipe (per AWWA C302-95) centered over the pipe being crossed; or
4. Any sanitary sewer main within a continuous sleeve.

Case 2 – New Water Main Installation (CWD-015-2)

Zone	**Special Construction Required for Water Main**
A	No water mains parallel to sanitary sewer mains shall be constructed in this zone without prior written approval from the Water Division.
B	If the sanitary sewer main paralleling the water main does not meet the Case 1, Zone B requirements, the water main should be constructed of one of the following: 1. Ductile iron pipe with hot dip bituminous coating; or 2. Dipped and wrapped ¼-inch thick welded steel pipe.
C	If the sanitary sewer main **crossing above the water main** does not meet the Case 1, Zone C requirements, the water main should have no joints within 10 feet from either side of the sanitary sewer main (in Zone C) and should be constructed of one of the following: 1. Ductile iron pipe with hot dip bituminous coating; or 2. Dipped and wrapped ¼-inch thick welded steel pipe.
D	If the sanitary sewer main **crossing below the water main** does not meet the Case 1, Zone D requirements, the water main should have no joints within 4 feet from either side of the sanitary sewer main (in Zone D) and should be constructed as for Zone C.

Water Mains and Pipelines Conveying Non-potable Fluids

When the basic separation criteria cannot be met between water mains and pipelines conveying non-potable fluids, the requirements described above for sanitary sewer mains should apply. This includes the requirements for selecting special construction materials and the separation requirements shown in Figures 1 and 2. Note that not all construction materials allowed for sanitary sewer mains will be appropriate for other non-potable fluid lines. For example, certain plastic lines may not be appropriate for the transport of some fuel products. The selection of compatible materials of construction for non-potable fluids is a decision to be made by the project engineer.

Water Mains and Sewage Force Mains

- Sewage force mains shall not be installed within ten feet (horizontally) of a water main.

- When a sewage force main must cross a water main, the crossing should be as close as practical to the perpendicular. The sewage force main should be at least one foot below the water main.

- When a new sewage force main crosses under an existing water main, and a one foot vertical separation cannot be provided, all portions of the sewage force main within eight feet (Horizontally) of the outside walls of the water main should be enclosed in a continuous sleeve. In these cases, a minimum vertical separation distance of 4 inches should be maintained between the outside edge of the bottom of the water main and the top of the continuous sleeve.

- When a new water main crosses over an existing sewage force main, the water main should be constructed of pipe materials with a minimum rated working pressure of 200 psig or the equivalent.

CWD-015-1
INSTALLATION OF NEW SANITARY SEWER

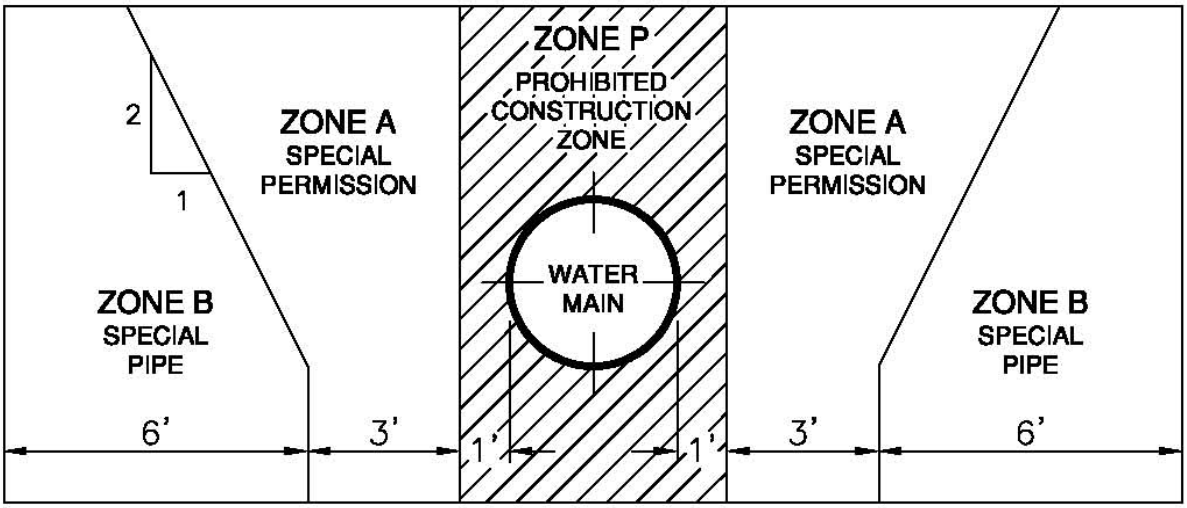

FIGURE 1 - PARALLEL CONSTRUCTION

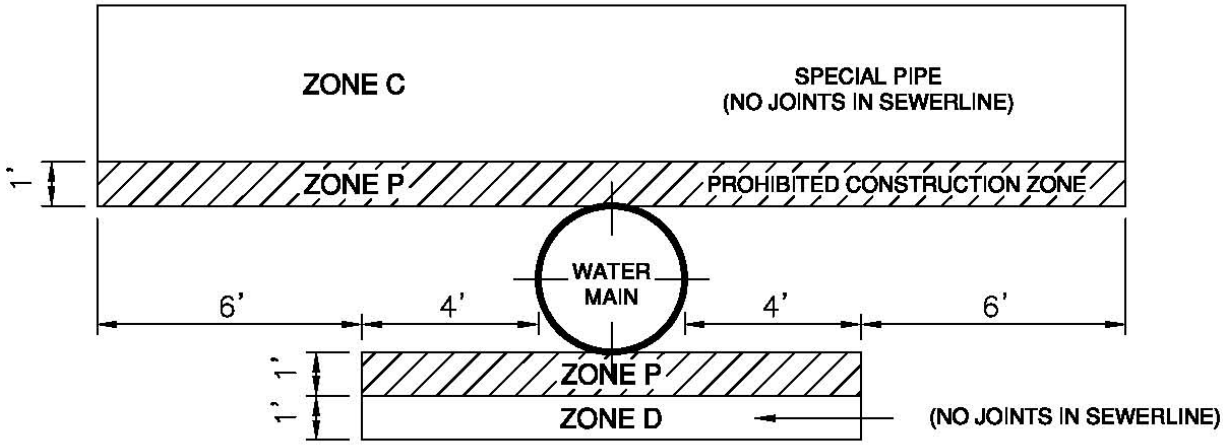

FIGURE 2 - CROSSINGS

WATER MAIN AND SANITARY SEWER SEPARATION CASE 1

CWD-015-2
INSTALLATION OF NEW WATER MAIN

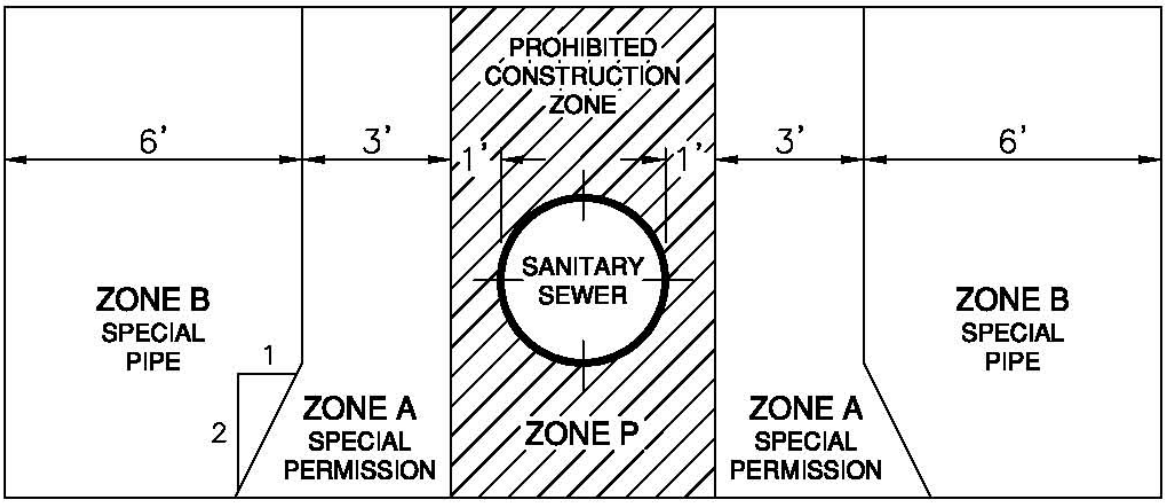

FIGURE 1 - PARALLEL CONSTRUCTION

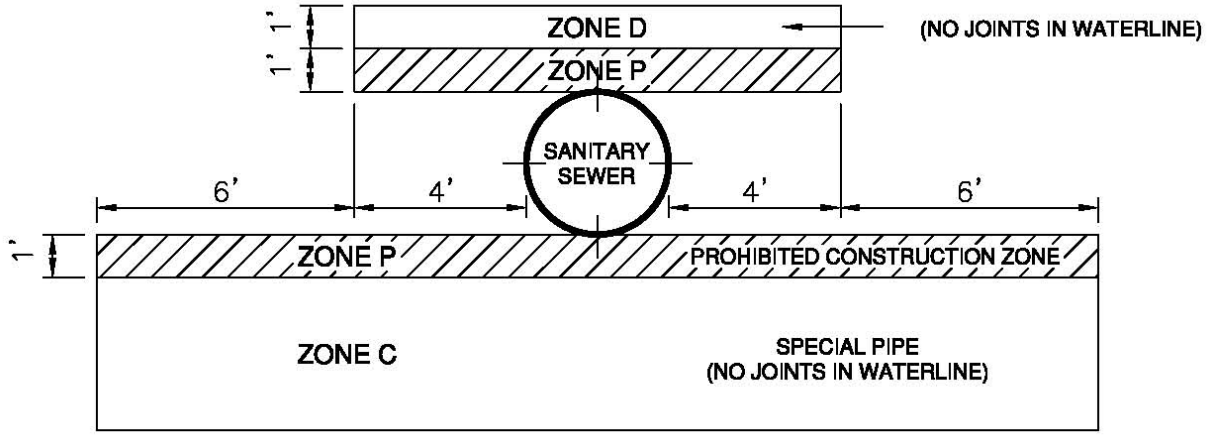

FIGURE 2 - CROSSINGS

WATER MAIN AND SANITARY SEWER SEPARATION CASE 2

2.07 PIPELINE CURVE DATA

Pipeline joints for ductile iron pipe shall not be pulled more than 80 percent of the manufactures' recommendations. When the pipe curve radius is greater than 241 feet, standard length pipe of 18 feet will pull the curve within the allowable joint deflection angle. When the pipe curve radius is less than 241 feet, the Engineer must calculate the required pipe length to be used with the following equation:

$$\text{Pipe Length} = R \times 2(\text{TAN } \Delta/2)$$

2.08 STANDARD DRAWINGS

Standard Drawings have been included in this handbook for reference.

2.09 PIPE JOINTS

All pipe joints shall be restrained with Romac Industries, Inc. "Grip Ring" gaskets, U.S. Pipe and Foundry Company "Field-LOK" gaskets or Water Division approved equal.

2.10 WATER PIPELINE MATERIALS

Unless otherwise authorized by Water Division's staff, all water pipelines 12" and under shall be ductile iron pipe, Class 350, per A.W.W.A. C-151. All water pipelines 14" and larger shall be either CML/CMC welded steel pipe and fittings in accordance with Water Division's standards or ductile iron pipe, Class 350, per A.W.W.A. C-151.

2.11 VALVES

Location:

- Water pipelines (12-inch diameter and smaller): To provide flexibility of operation, generally located on discharge side of pipeline connections; 3 at crosses, 2 at tees (Water Division may require 3 depending on the circumstances) and at beginning of dead end mains. Valves shall be spaced every 500 feet with no more than 2 fire hydrants between the valves.

- At all outlets, hydrant, blow-off, air valve and at service connections as shown on the Standard Drawings. Dead end valves placed for future extensions shall be suitably capped or plugged.

- If one of the options above does not apply, valves shall be spaced at 1,320-foot maximum intervals or as directed by Water Division.

Size:

- Full line size gate valves through 16-inch. For valves larger than 16-in, contact the Water Division. Maximum velocity through valves normally limited to 12 feet per second, never to exceed 20 feet per second.

Unless otherwise provided for, all valves through 16-inch shall be resilient seat gate valves in accordance with AWWA Standard C509.

Valves shall be installed with valve can and cover as shown on Water Division's Standard Drawing CWD-500.

Pressure class rating shall be the same as the water pipe on which the valve is being installed.

2.12 COMBINATION AIR VACUUM AND AIR RELEASE VALVES

Air valves shall be located at all high points of water pipelines; however, air valves shall not be installed at the end of cul-de-sacs unless the slope of the water pipeline is 5% or greater. Minimum size of air valves shall be 2" for all pipelines through 16-inches.

In phased tract development, air valves are often located at the end of the pipeline as dictated by the phasing plan. When additional phases are constructed, the air valve shall be removed unless it is required by one of the criteria listed above.

Provide 4-inch guard posts on either side per Water Division's Standard Drawing CWD-900.

2.13 BLOW-OFF VALVE ASSEMBLIES

Blowoffs valve assemblies shall be installed in accordance with Water Division's Standard Drawings CWD-411 or CWD-411-1. Blowoff valve assemblies shall be installed at the termination of all dead end mains. If special conditions so warrant, additional blow-off valve assemblies shall be installed at low points in the water main.

2.14 PUBLIC FIRE HYDRANTS

Hydrants shall be set so that they are easily accessible to fire department pumpers. Locations in depressions, cut outs or on embankments high above the street are **not** acceptable. Hydrant locations are subject to the review and approval of the Fire Marshal. A signature block for the Fire Department is required on the Plans.

Hydrants shall be 6-inch, wet barrel, type A.W.W.A. C-503, with one 4-inch outlet and one 2 1/2-inch outlet and a 6-inch ductile iron bury.

Super hydrants, for commercial and industrial districts, shall have two 2 ½-inch outlets and one 4-inch outlet and a 6-inch ductile iron bury.

Spacing of fire hydrants in residential areas shall be 500 feet where the homes are equipped with fire suppression sprinklers and 350 feet when the homes are not equipped with fire sprinklers. For commercial and industrial areas, the hydrants shall be spaced every 350 feet. Design consideration shall be taken to locate hydrants at intersections wherever possible.

Fire hydrants shall be installed in accordance with Water Division's Standard Drawing CWD-700.

2.15 BACKFLOW PREVENTION

Where Water Division's Domestic Water System has the potential of becoming cross-connected to other water supplies or sources, an approved backflow prevention device is required by Title 17, Drinking Water Supplies, of the California Administrative Code, and shall be installed in accordance with Water Division's Standard Drawings and approved materials list. An approved backflow prevention device is required for all fire service connections. All non-residential water services shall have a Water Division approved backflow prevention device installed adjacent to meter unless otherwise approved by Water Division.

2.16 SERVICE INSTALLATIONS

Services shall be shown on the Plan at the approximate center of each lot. Reference distance and pipeline stationing shall be noted on the Plan. The private engineer shall give due consideration to any proposed improvements by others (i.e., driveways, catch basins, pullboxes and sewer laterals).

Services and meters shall be sized in accordance with the provisions of Section 1009 of the Uniform Plumbing Code, using minimum pressures expected in the system. Minimum service pipe diameter shall be 1-inch with a minimum meter size of 3/4-inch.

All meters will be set by the Water Division.

The Contractor will be required to lay all services on new water main construction, including the meter stop, meter spacer and the meter couplings, and set the meter box in accordance with Water Division's Standard Drawings CWD-600, CWD-601, CWD-615, CWD-620, CWD-621 and CWD-622. Meter spacers will be provided by the Water Division. All pipe ends shall be suitably covered to prevent any entrance of foreign matter into the service lines.

2.17 METER VAULTS

All vaults for water and fire services, 3-inches and greater, shall be shown in a separate detail on the Plans. The detail shall show location and distances to driveways, curbs, sidewalks, structures and utilities within 10 feet of the meter vault. Both sides of the vault shall be stationed in the detail. Structural calculations, stamped and signed by a registered civil engineer, shall be submitted for vaults located in traffic areas.

2.18 BOOSTER STATIONS

If the project requires a booster station, contact the Water Division prior to starting design.

2.19 CORROSIVE SOIL

Where steel pipelines are to be constructed in corrosive soil conditions, as shown in the Preliminary Soil Report, the engineer shall contact the Water Division for direction.

3.0 PLAN FORMAT AND REQUIREMENTS

The Developer's engineer shall prepare water system improvement plans that are clear, concise, and meet Water Division's standards. A set of plans that meet all the requirements set forth herein, but are difficult to interpret, mislead the Contractor, confuse the reader, or do not address previous plan check comments, are unacceptable and will be subject to rejection without review.

3.01 SHEET FORMAT – GENERAL

Drawings shall be drawn in ink on D size (24" x 36") mylar (4 mil double matted) sheets with Water Division's standard title blocks as provided in the Public Utilities Water Division Engineer/Developer Design CD. Please contact Water Division's Engineering Department for a copy of the CD.

The improvement plans shall be professional quality especially prepared as WATER DRAWINGS. Work shall be of standard engineering practice and shall be well arranged, neat, legible and present the proposed construction without confusion. Applicable prints, submitted for checking, shall be clear, bright duplications. Profiles are not generally required for water mains under 12-inches in diameter. However, profiles will be required when the construction will involve numerous grade changes to avoid conflicts with other utilities or buried conflicts or when required by the Water Division. Profiles will also be required when the water main will be in an unimproved area, easements or areas without curb and gutter.

All drawings shall be drawn to scale using 1"= 40' on the horizontal scale. Profiles, when required, shall be drawn at an appropriate vertical scale that matches the plan data. Match lines and continuations from sheet to sheet shall be used and identified with applicable station points and cross-reference. Duplicate data, outside of the match lines, shall be fogged or shaded. Always indicate true north with a suitable north arrow. Indicate tract number and sheet number on all drawings. Each sheet shall have a title block with tract number, street name and stations appearing on that sheet. Stationing must conform to established stationing on approved City plans. Stationing on all sheets shall be from the left to right (even if this requires north to be "down"). No negative stationing. If you have any questions or problems on stationing, contact the Water Division prior to design.

For special assemblies, unusual and/or complex connections provide a detail schematic (preferably on the same sheet). The detail schematic shall be drawn to scale, show pipe size, and shall fully identify all the parts in the detail. Show and call out all special features and indicate scale.

The Engineer shall note on the plans, all connections to existing water facilities and note who is to construct them. Contractors are not authorized to make connections to existing water facilities. Contractors shall not operate any valve on any portion of Water Division's system that is under pressure.

3.02 COVER SHEET

As a minimum, the Cover Sheet shall show the following:

1. Water Division's standard title block.
2. General notes. See Section 3.05 herein.
3. Vicinity Map showing a north arrow, scale and project location.

4. Index Map at a 1” = 100’ scale, showing the proposed improvements and plan sheet index. If there is a water line in an easement, show the easement limits.
4. Provide a City approved Bench Mark.
5. Show legend (included in the Water Division Engineer/Developer Design Handbook CD).
6. Provide a “Bill of Materials” which should include the applicable Standard Drawing Number.
7. Provide a signature block for the Fire Department when the installation of fire hydrants are required or when existing fire hydrants are relocated.
8. Provide a signature block for Public Utilities Electrical Division.
9. Provide Underground Service Alert notification (this should be on each plan sheet).
10. The following note “NOTE: THIS SYSTEM SERVED BY _____ ZONE”.

3.03 PLAN FORMAT

The plan sheets shall be drawn at a horizontal scale of 1" = 40'. As a minimum, the drawings shall show the following:

1. **Title Block** – Water Division’s standard title block shall be used and shall include the City case or project number and street names.

2. **North Arrow** - North Arrow shall point either up or to the left to conform with stationing.

3. **Street Names** - All street names shall be shown.

4. **Lot Lines** - All lot lines or parcel lines, lot numbers, frontage distances and full pad elevations (i.e., 1020.5 not 20.5). All adjacent tracts shall be identified.

5. **Right-of-Way** - Existing and proposed right-of-way shall be identified with dimensions from street centerline.

6. **Utilities** - All existing and proposed utilities shall be shown including, but not be limited to, water (existing Water Division water pipelines shall be identified by Water Division Plan No.), sewer, gas, power, telephone, storm drain, irrigation, traffic, and cable television. Each utility shall be identified with a symbol and the size of the utility shall be shown. Dimensions from street centerline to centerline of each utility shall be shown.

7. **Existing and Proposed Improvements** - All existing surface improvements shall be shown including, but not limited to, curb and gutter, edge of pavement, power poles, driveways, sidewalks, and fences. Existing and/or proposed curbs shall be identified with dimensions from street centerline shown.

8. **Proposed Pipeline** - Proposed pipeline shall be indicated with a heavy line and dimensioned from the street centerline to the centerline of the pipeline.

9. **Stationing** - Stationing for pipelines shall be along the centerline of the improvement. Stationing shall increase from left to right. Stationing shall be identified with tick marks at 100' intervals.

For water pipelines with curves, stations for the beginning and end of each curve shall be shown. In addition, a curve data table shall be included showing the delta, curve radius, curve length, and tangent length for each curve.

10. **Match Lines** – Match lines for each end of the sheet shall be shown as follows:

    Sta 15+00.00 Match Line
    See Sheet 5

11. **Water pipelines** - Water pipelines and appurtenances (valves, fittings, fire hydrants, air valves, water services, and blowoffs) shall be identified by station and a numerical identification corresponding to a construction note as shown in the Public Utilities Water Division Engineer/Developer Design CD.

    Only those construction notes that apply to each sheet shall be shown.

    All connections to existing water system shall be identified by station and size. Details for connections shall be used where required. Each connection shall have the following note, "System Connection by City Forces".

    If a water main crosses a railroad track, the steel casing shall be shown with the beginning and ending stations. The casing shall be labeled with its size and thickness. Boring and receiving pits shall be shown, flagged and labeled. The engineer shall submit a copy of the permit issued by the railroad for the proposed pipeline crossing and the boring and jacking operation.

    The engineer shall detail all water and sewage pipeline crossings and show the clearance between the two pipelines.

3.04 PROFILE FORMAT REQUIREMENTS

Only the profile for the waterline shall be shown. All other utility profiles shall not be shown unless conflicting, or where crossing over or under (i.e. storm drain).

1. **Stationing** - Stations shall be shown along bottom of profile grid at 100 foot intervals. Profile stationing shall line up with plan stationing and shall be shown at the bottom of the profile grid.

   Label and show stations and flowline elevations at the beginning of the pipeline, every 100 feet, at the B.C. and E.C. of curves, all appurtenances, and at the end of the pipeline.

2. **Datum Elevations** - Elevations shall be shown at even gridlines on both ends of the profile.

3. **Existing and Proposed Ground Surface** – Show the proposed surface over the proposed pipeline and flag the surface elevations every 100 feet. Note elevations to the nearest 0.1 feet.

4. **Match Lines** - Match lines for each end of sheet shall be shown as follows:

   Sta 15+00.00 Match Line
   See Sheet 5

5. **Water pipelines**: See the Public Utilities Water Division Engineer/Developer Design CD on how to show the pipeline, pipeline length, stationing, pipeline slopes and all utility crossings.

   Show and label the connection to the existing water main. The label should show the existing station and elevation.

   Pipelines under 12-inches in diameter shall be 36-inches below the top of the finished surface to the top of pipe. Pipelines 12-inches and over shall be 48-inches below the top of finished surface to the top of the pipe.

   Show pipe size, pipe material, pressure class and pipe slope using S = 0.0000 format.

6. **Utility Crossings**: Both existing and proposed underground utility crossings shall be shown. Show all existing topo which impacts the proposed water pipeline.

7. **Railroad Crossings**: When the water main runs under a railroad track, show the size, thickness, material and limits of the casing. Stations and elevations shall be shown for each end of the casing along with the grade of the casing in the S = 0.0000 format.

3.05 GENERAL NOTES

All of the following General Notes may not apply to your project. The engineer should show only the notes that apply to the project.

SAMPLE GENERAL NOTES

1. All construction shall be in accordance with these Plans and in conformance with the City of Riverside Public Utilities Department, Water Division, Standard Specification No. 205 for Water Distribution Systems, latest revision; all applicable A.W.W.A. Standards and Specifications, except as noted; and the Standard Specifications for Public Works Construction (Greenbook), latest adopted edition and amendments.

2. All water mains 12 inch and under shall be Class 350 D.I.P. per A.W.W.A. C-151. All pipe joints shall be restrained with Romac Industries, Inc. “Grip Ring” gaskets, U.S. Pipe and Foundry Company “Field-LOK” gaskets or Water Division approved equal.

3. Approval of this Plan by the Water Division does not relieve the private engineer of the design responsibility thereof. The private engineer signing these plans is responsible for assuring the accuracy and acceptability of the work hereon. In the event of discrepancies arising during construction, the private engineer shall be responsible for determining an acceptable solution and revising the plans for approval by the City.

4. The developer shall be responsible for preserving or re-establishing and referencing survey monuments destroyed, disturbed or buried as a result of the construction shown hereon.

5. Water mains shall be laid to the line and grade shown on the Plan and per CWD-040.

   A. The Developer’s Engineer shall provide a construction off-set line and station all fittings and appurtenances. Cut sheets shall be provided for pipelines on all streets.

B. Minimum depth of cover over water mains under 12-inches in diameter shall be 3.0 feet, unless otherwise noted. All 12-inch diameter water mains shall have 4.0 feet of cover.

6. The existence and location of any underground utility pipes, conduits, cables or structures shown on these Plans were obtained by a search of available records. To the best of our knowledge, there are no existing utilities except as shown on these Plans. The Contractor is required to take due precautionary measures to protect the utility lines shown, or any other lines not of record or not shown on these Plans.

7. Proposed electrical underground and street light facilities are not shown on the Plan. The Contractor shall coordinate installation with the Developer and Public Utilities Department, Electrical Division, 951-826-5452, for locations of the proposed electrical and street light facilities.

8. Pipe shall be handled so as to protect pipe at all times and shall be carefully bedded to provide continuous bearing and to prevent uneven settlement. Pipe shall be protected against flotation at all times. Open ends shall be sealed at all times when construction is not in progress.

9. Unless otherwise approved, water mains and sewer mains shall not cross with less than 1.0 foot of vertical clearance. Water service lines and sewer laterals shall not be in the same trench, a minimum, horizontal clearance of 10 feet is required. Water mains shall clear all house sewer laterals by a minimum of 1.0 foot vertical clearance (per CWD-015 and CWD-023).

10. Water meter boxes and fire hydrants shall be placed at curb site locations. The Contractor shall adjust the meter boxes to sidewalk grade after the sidewalks have been poured. Water meter boxes shall not be located in driveways.

11. A material list, per Water Division Specification No. 205, Section 3-11 and material certifications must be submitted for Water Division approval prior to installation.

12. The Contractor may begin construction only after a preconstruction meeting is held with the Water Division Engineering staff. Contact Water Contract Administration at 951-826-5549, at least one week prior to the planned start of construction of the waterlines to arrange this meeting.

13. The Contractor shall call in a location request to Underground Service Alert (USA), 1-800-227-2600, two working days before digging. No Street Opening Permit will be issued by the Public Works Department involving excavation for underground facilities unless the applicant has been provided an inquiry identification number by USA. All necessary permits shall be taken out by the construction Contractor. A Street Opening Permit, issued by the Public Works Department, or a Riverside County Encroachment Permit, depending upon jurisdiction, is required prior to the start of construction.

14. The Contractor shall pothole existing utilities, prior to construction, to determine the depth of cover. The water main shall be installed with the required vertical clearance. If insufficient cover exists, the Contractor shall contact the private engineer who signed the plan to determine an acceptable solution.

15. The Contractor shall request Water Division inspection two working days prior to trenching. Plans and Specifications shall be on-site at all times.

16. Water mains shall be sand bedded in accordance with CWD-040. Native material with a sand equivalent greater than 30 will be allowed.

17. The Contractor shall not backfill any trenches until he has obtained as-built stationing on all fittings and appurtenances. Pressure testing will not be allowed until "As-Builts," submitted by the Contractor, have been approved by the Water Division.

18. The Contractor shall bulkhead mains, place and compact backfill, test, sterilize and pass bacteriological testing before any tie-ins are made to the City system. City forces will make the final system connections from the existing main. No connections will be made until all testing is complete and written passing bacteriological test results have been submitted to the Water Division.

    A. Pressure testing shall be conducted after the trench backfill has passed the required compaction tests. Hydro test pressure shall be 200 psi for two hours. The leakage limit is 15 gallons per inch diameter per mile, per 24 hours.

    B. Gas chlorination is required for a minimum period of 24 hours. After the minimum chlorination contact time, the Contractor shall dechlorinate the test water in accordance with the California Regional Water Quality Control Board, Santa Ana Region Order No. 98-67 and National Pollution Discharge Elimination System (NPDES) No. CAG998001.

    C. A minimum of two bacteriological tests are required, per day. Approximately one sample shall be taken per 500 feet of main for two consecutive days.

19. Refer to City of Riverside Public Works Department drawings (list the R-, S-, and D- numbers) for project coordination.

20. Blue hydrant reflectors are required for each hydrant.

21. All curbs, gutters, sewer lines and storm drain lines must be installed prior to beginning any water line installation.

4.0 CONSTRUCTION MATERIALS FOR WATER DISTRIBUTION MAINS

4.01 GENERAL

All material shall comply with the Standard Specifications for Public Works Construction (Greenbook), latest adopted edition, with Amendments, except as modified herein.

4.02 MATERIAL AFFIDAVITS AND CERTIFICATIONS

All pipe, fittings, valves and appurtenances shall be supplied with the manufacturers affidavit of compliance or certification of compliance stating that the furnished material has been sampled, tested and inspected in accordance with the reference requirements and that the results thereof comply with the requirements of the specifications. Certifications shall be addressed to the City of Riverside and shall identify the item supplied, specify the project and plan number for which the material is being supplied.

4.03 DUCTILE IRON PIPE AND FITTINGS

4.03.1 General. This section applies only to ductile iron pipe (D.I.P.) and fittings for water distribution mains. All ductile iron pipe shall be Class 350 D.I.P., per A.N.S.I. A21.51/A.W.W.A. C-151. Fittings and appurtenances shall have a minimum pressure rating of 250 psi and shall be manufactured in accordance with A.N.S.I. A21.10/A.W.W.A. C-110 and/or A.N.S.I. A21.11/A.W.W.A. C-111. Ductile iron compact fittings shall have a minimum pressure rating of 350 psi and shall be manufactured in accordance with A.N.S.I. A21.53/A.W.W.A. C-153.

Inspection within the manufacturing plant shall be provided by the manufacturer. Copies of all test reports shall be submitted to the Water Division.

Fittings and appurtenances shall consist of, but not be limited to, bends, tees, crosses, reducers, plugs, caps, blow-offs, fire hydrant buries and connections to mainline valves.

4.03.2 Pipe Coatings. Pipe, fittings and appurtenances shall be supplied with the interior lined with cement mortar per A.N.S.I. A21.4/A.W.W.A. C-104, while the exterior shall be coated with a bituminous coating having a minimum thickness of 1 mil.

4.03.3 Joints. Ductile iron pipe and fittings shall have one of the following joint types and shall be called out on the plans:

A. Mechanical joint per A.N.S.I. A21.11/A.W.W.A. C-111

B. Rubber gasket push-on joint per A.N.S.I. A21.11/A.W.W.A. C-111

C. Flanged joint per A.N.S.I. A21.10/A.W.W.A. C-110

D. Restrained push-on joint per A.N.S.I. 21.11/A.W.W.A. C-111. Both “Field-LOK” Gaskets, as manufactured by U.S. Pipe and Foundry Company and “Grip Ring” gaskets, as manufactured by Romac Industries, Inc. are accepted for joint restraint.

4.03.4 Approved Pipe Manufacturers. The following manufactures have been approved by the Water Division:

A. Pacific States Cast Iron Pipe Company

B. United States Pipe and Foundry

C. American Cast Iron Pipe Company

4.03.5 Approved Fitting Manufacturers. The following manufactures have been approved by the Water Division:

A. Pacific States Cast Iron Pipe Company

B. United States Pipe and Foundry

C. Star

D. Sigma/Nappco

E. Union

F. Reliable

G. American Ductile Iron Pipe

4.04 STEEL PIPE

4.04.1 General. This section applies to cement-mortar lined and coated steel pipe for water distribution mains. All C.M.L. & C. steel pipe used on a project shall be manufactured under one roof, by one company. This provision is to confine the manufacturing process of the pipe and pipe specials to one manufacturer. For welded steel pipe, this will include the milling of steel plate or coil into the pipe cylinder, lining and coating operations, the fabrication of fittings and pressure testing. Welded steel pipe may be manufactured by a Water Division approved subcontractor of the pipe supplier, with the supplier providing for fabrication of all fittings and appurtenances. However, the supplier shall provide the quality control inspection of the pipe manufacturing process.

Pipe supplied by the Contractor shall be engineered and designed by the pipe manufacturer. This shall include all engineering calculations called for in the applicable A.W.W.A. or ASTM standards and any other calculations required to design the pipe in accordance with sound engineering practices. The pipe manufacturer shall submit shop drawings covering all pipe manufacturing specifications and fabrication details.

Inspection within the plant shall be provided by the manufacturer. Testing to insure compliance with the requirements shall be made in accordance with A.N.S.I./A.W.W.A. C-200 and C-205 within the Continental United States at the last point of loading on rubber tired vehicles before delivery to the job site.

4.04.2 Design Criteria. C.M.L.&C. steel pipe shall be designed to meet the following requirements:

A. A working water pressure of 150 psi.

B. Water hammer pressure at 45 psi.

C. Design pressure of 150 psi.

D. Traffic loading to be AASHTO H-20, S-16, with an impact factor of 1.5 for depths to 4.0 feet.

E. Deflection limit of 2 percent of pipe I.D.

F. Water hammer stress + static pressure stress shall not exceed 0.75 yield stress.

G. Weight of soil to be 140 lbs. per cubic foot (4 foot minimum), and a K_u of 0.150.

H. The cross-sectional area of steel in the pipe wall shall be based on ½ of the yield point of the steel used, but not to exceed 16,500 psi. Minimum wall thickness shall be 12 gauge (0.105-inch).

The manufactures specifications for fabrication, handling, installation, rubber gaskets and joint lubricant shall be submitted to the Water Division.

4.04.3 Fabricated Steel Pipe. Fabricated steel pipe shall consist of straight butt seam or spiral butt seam electrical welded steel cylinders, shop fabricated from plates or sheets, manufactured and tested in accordance with A.W.W.A. C-200 and Federal Specification SS-P-385a. In addition, for water pipe 6-inches and larger, ASTM A-570, Grade 36, as referenced in A.W.W.A. C-200, shall be used.

4.04.4 Cement-Mortar Lining and Coating. All steel pipe, 4 to 12-inches in diameter, shall be cement-mortar lined and coated in accordance with the following table:

Lining Thickness (In.)	Tolerance (In.)	Coating Thickness (In.)	Tolerance (No Minus Tolerance) (In.)
5/16	± 1/16	¾	+ 1/4

4.04.5 Approved Pipe and Fittings Manufacturers. The following manufacturers have been approved by the Water Division:

A. Ameron Pipe Products Group

B. Northwest Pipe and Casing Company

C. Kelly Pipe Company

4.05 MISCELLANEOUS PIPE

4.05.1 Copper Tubing or Pipe. Copper tubing or pipe used for service connections, air valves and/or blow-offs shall be Type “K” soft copper, conforming to ASTM B-88. Hard drawn copper shall be used for air valve and blow-off risers.

When wrought copper solder type fittings are shown on the plans or Standard Drawings, the joints shall be soldered using a lead free, tin based alloy solder meeting Federal requirements for lead free solders, mandated by the Federal Safe Drinking Water Act, with a flux specifically designed for the solder alloy. The following are acceptable solders:

A. J. W. Harris Company

B. Stay Safe 50

C. Stay Safe Bridget

4.05.2 Red Brass Pipe. Red brass pipe used for service connections, air valves and/or blow-offs shall conform to ASTM B-43.

4.05.3 Steel Pipe. Steel pipe used in 4-inch and larger fire or domestic services and all guard posts shall conform to ASTM A-120, Schedule 40.

4.05.4 Galvanized Steel Pipe. Galvanized steel pipe used in 2-inch service bypasses shall conform to ASTM-A120, Schedule 40.

4.05.5 Gate Box Material. The minimum thickness of steel pipe used for an 8-inch gate boxes shall be 14 ga. The minimum thickness of steel pipe used for a 10-inch gate boxes shall be 12 ga. The pipe shall be seamless steel, conforming with the requirements of A.N.S.I./A.W.W.A. C-200. The pipe shall be factory dipped in Trumble Asphalt Dip, or Water Division approved equal.

4.06 PAINT AND PROTECTIVE COATINGS

4.06.1 Painting Schedule. All paint and protective coatings shall be holiday free. The following paint schedule shall apply to Water Division facilities:

A.	Gate Box Cap & Rim:	1 coat of Rust-Oleum #1069, Primer and 2 coats of: Fuller O'Brien #312-80, National Blue
B.	Air Valves:	1 coat of Rust-Oleum #1069, Primer and 2 coats of: Fuller O'Brien #312-81, Shutter Green, or Rust-Oleum #7638, Forest Green, or Pervo #2428, Industrial Green
C.	Guard Posts:	1 coat of Rust-Oleum #1069, Primer and 2 coats of: Fuller O'Brien #312-81, Shutter Green, or Rust-Oleum #7638, Forest Green, or Pervo #2428, Industrial Green
D.	Vault Covers:	1 coat of Rust-Oleum #1069, Primer and 2 coats of: Rust-Oleum #473, Industrial Aluminum, or Pervo #2404, Aluminum
E.	Above Grade Piping:	1 coat of Dunn Edwards #43-5, Alkyd Primer and 2 coats of: Dunn Edwards, Syn-Lustro 10 Series, San Tan
F.	Fire Hydrants:	1 coat of Rust-Oleum #1069, Primer and 2 coats of: Fuller O'Brien #312-74, Hi-Way Yellow, or Rust-Oleum #7644, Federal Safety Yellow, or Pervo #2420, Fire Hydrant Yellow

G.	Blow-off Hydrants:	1 coat of Rust-Oleum #1069, Primer and 2 coats of: Fuller O'Brien #312-74, Hi-Way Yellow, or Rust-Oleum #7644, Federal Safety Yellow, or Pervo #2420, Fire Hydrant Yellow Top of Hydrant - Fuller O'Brien #312-80, National Blue
H.	Valves and Piping:	Koppers #50, or approved equal
G.	Misc. Appurtenances:	Water Division Approved Epoxy Paint

4.06.2 Protective Coatings. All flanged joints and flexible couplings in contact with soil shall be coated with one coat of Super Tank Solution or Koppers #50 bitumastic, wrapped with two layers of 8 mil polyethylene, and secured to the pipe and seam sealed with 2-inch wide Scotchrap 10 mil #50 or Water Division approved equal.

4.07 VALVING, APPURTENANCES AND MISCELLANEOUS MATERIALS

4.07.1 Nuts and Bolts. Where nuts and bolts are to be furnished for fastening flanged joints, they shall be hexagonal head machine bolts and hexagonal nuts. Bolt and nut material shall be per Steel Standard ASTM A-307, Grade B.

Dimensions shall be in accordance with A.N.S.I. B-18.2.1.

Threads shall be in accordance with A.N.S.I. B1.1, coarse thread series, Class 2A fit on bolts and Class 2B fit on the nuts.

Nuts and bolts shall be cadmium plated conforming to ASTM A-165, type TS; electroplated zinc per ASTM B-633, SC 1; or hot-dip galvanized per ASTM A-153, Class C.

Minimum bolt lengths shall be the sum of the mating flange thicknesses, the gasket, and the depth of the nut plus 1/8" before torquing.

Break-off bolts for fastening fire hydrants to the bury shall be 5/8-inch diameter by 3-inches long, counter bored 5/16-inch, to a depth of 2 3/8-inches.

4.07.2 Resilient Wedge Gate Valves. Resilient wedge gate valves shall conform to the latest revision of A.S.N.I./A.W.W.A. C-509 and the following:

1. The body, bonnet and gate shall be made of iron, with all internal mountings and working parts made of bronze.

2. Valve stems shall be non-rising, O-ring sealed, with two O-rings above the thrust collar, with a 2-inch square operating nut, opening counter-clockwise, and shall be designed for a 200 psi working water pressure. The stuffing box opening at the valve stem shall be coated with the dry film lubricant "Dry-Lube" or a Water Division approved equal.

3. Resilient wedge gate valves shall have sizes and type of valve ends as shown on the plans or Standard Drawings.

4. Resilient wedge gate valves shall be handled and stored in accordance with A.N.S.I./A.W.W.A. C-509, Appendix A.1 through A.4.

5. Resilient wedge gate valves shall have all interior and exterior ferrous surfaces, exposed to water, epoxy coated by the manufacturer. The coating shall be applied at the factory in accordance with A.W.W.A. C-550.

6. Resilient wedge gate valves shall be furnish with a certificate of compliance, catalog date, certified drawings and an affidavit stating that the interior coatings have been applied in accordance with the required specifications, prior to assembly.

4.07.3 Fire Service Resilient Wedge Gate Valves. Resilient wedge gate valves used in fire services shall be of an outside screw and yoke (OS&Y) type with flanged ends, rising stem design, conventional packing and furnished with a handwheel. Valves shall be listed and approved by Underwriter Laboratories, Inc., or Factory Mutual.

4.07.4 Tapping Gate Valves. Tapping gate valves shall be of the resilient wedge design and have a Class 125, A.N.S.I. B-16.1, flanged inlet and an outlet as shown on the plans.

Tapping valves shall be compatible with the tapping sleeve and tapping machine utilized for wet tapping the water main.

The following manufacturers have been approved by the Water Division:

A. American Flow Control Series 500

B. Clow Valve Company Series 6100

C. AVK Series 25

D. M & H Series 3067 (NRS)
(3068 for OS&Y)

E. Mueller Model A2360

4.07.5 Bronze Gate Valves. Bronze gate valves ¼-inch through 3-inches shall conform to Federal Specification WW-V-54D, Class A, Type 1, and the following:

1. Valves shall have a non-rising stem, union bonnet, solid wedge disc design with screw ends.
2. Valves to be used for water, oil and gas shall be rated for 200 psi.
3. Valves to be used for saturated steam shall be rated for 125 psi.
4. Valves to be used in an air valve assembly or a 2-inch blow-off assembly shall be fitted with a 1-inch square x ½-inch thick cast iron operator nut.

The following manufacturers have been approved by the Water Division:

1. Stockham Model B-130 or B-103
2. Milwaukee Valve Company Model 1142

4.07.6 Bronze Ball Valves. Bronze ball valves ¼-inch through 2-inches shall be constructed with a heavy cast bronze body with a blow-proof stem, RPTFE seats, Stuffing box ring, adjustable packing gland and a chromium-plated ball. The Apollo 70-100 Series has been approved by the Water Division.

4.07.7 Air Release Valves. Air valves shall conform to the following:

1. Valves shall be combination air and vacuum relief and air release.
2. Valves shall be designed for a working pressure of 150 psi and a 300 psi test pressure.
3. The valves shall be of the air release/vacuum type, and shall be constructed of brass with stainless steel internal parts. The internal surfaces of the parts that are not brass or stainless steel, shall be epoxy lined with a minimum of 12 mils of epoxy material that has been approved by the Water Division. The coating shall be holiday free.
4. Valves 2-inches and smaller, shall have threaded inlets.

The following Crispin valves have been approved by the Water Division:

1-inch, Model UL10.1X Air and Vacuum

2-inch Model UL20.1X Air and Vacuum

4-inch Model UL41X Air and Vacuum

4.07.8 Check Valves. Check valves 2 ½-inch and larger shall conform to the following:

1. Valves shall be of a swing type with grooved ends complying with A.W.W.A. C-508. Valve bodies for valves up to 4-inches shall be bronze. Valves bodies for valves 6-inches to 12-inches shall be ductile iron.
2. Valves shall be designed for a working pressure of 175 psi.
3. The valves shall be supplied with an external lever arm, external spring, and a no-flow micro switch.
4. Check valves shall operable in both the vertical and horizontal positions.
5. The disc arm, pin, and spring material shall be constructed of stainless steel in conformance with ASTM A276, Type 316. The valve seat shall be bronze.

Check valves made by Victaulic, Series 317 C-040 (060) have been approved by the Water Division.

4.07.9 Gaskets. Gaskets shall be 1/8-inch minimum thickness, full face, cloth inserted rubber, meeting Federal Specification HH-P-151.

4.07.10 Insulation Gaskets. Unless otherwise specified, insulation gaskets shall conform to the following requirements:

1. The gaskets shall have a pressure rating equal to or greater the flange pressure rating.
2. The gaskets shall be full pattern, fabric-reinforced phenolic, neoprene face, 1/8-inch thick.

3. The gaskets shall have the following assembly minimum physical characteristics:

    a. Compression strength ..... 24,000 psi

    b. Dielectric strength ..... 500 V/Mil

    c. Operating temperature ..... up to 175° F

    d. Water absorption 1.6%

4. A one-piece polyethylene water-sleeve shall be used in combination with a single phenolic washer on each bolt. A steel washer designed to be used with the insulating washer shall be used, one on each side of the flange bolts.

    a. One-piece sleeve washers shall have the following physical characteristics:

        (1) Sleeve Thickness 1/32-inch

        (2) Washer thickness 5/32-inch

        (3) Dielectric strength ..... 1200 V/Mil

        (4) Operating temperature ..... up to 175° F

        (5) Water Absorption ..... 0.22% Max.

    b. Single phenolic washers shall have the following physical characteristics:

        (1) Thickness 1/8-inch

        (2) Compressive strength ..... 26,000 psi

        (3) Dielectric strength ..... 500 V/Mil

        (4) Operating temperature ..... up to 300° F

        (5) Water Absorption ..... 1% Max.

    c. Flange Insulation kits shall be manufactured by one of the following:

        (1) PSI Products, Inc.

        (2) Central Plastics Company

        (3) CALPICO Inc.

4.07.11 Valve Box Caps. Valve box caps shall consist of a cast iron cap, marked CWD with the City of Riverside pattern. The cap shall be supplied to fit either 8-inch or 10-inch valve boxes. The cap shall be painted with one coat of primer and two coats of color paint (see Section 4.06.1, Painting Schedule, for the painting requirements). South Bay Foundry is a Water Division approved manufacturer.

4.07.12 Fire Hydrants. Fire hydrants shall conform to the following:

1. Hydrants shall have a 6-inch flanged inlet connection with six ¾-inch holes, drilled on a 9 3/8-inch bolt circle.

2. Outlet nozzles shall be of the quantity and size specified on the plans. Threads shall be National Standard Hose Threads.

3. Hydrants shall be equipped with 1 ¾-inch pentagon spanner nuts on the operator stems and nozzle caps. Nozzle caps shall be constructed of cast iron.

4. Hydrants manufactured by Clow Corporation shall be equipped with Type B carrier valves. Valve rubber shall be 5/8-inch thick for 2 ½-inch outlets and ¾-inch thick for 4-inch outlets.

5. Valves shall be of the slow opening variety.

6. Stems shall be equipped with a "O-ring" packing and shall be constructed in accordance with ASTM B-62 (85% copper, 5% tin, 5% lead and 5% zinc).

7. Hydrants shall be painted per A.W.W.A. C-503. The exterior color shall be in accordance with Section 4.06.1, Painting Schedule.

8. A certificate of compliance shall be supplied showing that the hydrant conforms to A.N.S.I./A.W.W.A. C-503.

9. Outlet sizes on a regular hydrant are one 2 ½-inch and one 4-inch. Sizes on a super hydrant are two 2 ½-inch outlets and one 4-inch outlet.

The following fire hydrants have been approved by the Water Division:

a. Regular Fire Hydrant

   (1) Clow Valve Company, Ranger 900 Series, Model 950

   (2) American AVK Co., Model 24/40

   (3) James Jones Company, Model J-4040-C

b. Super Fire Hydrant

   (1) Clow Valve Company, Ranger 900 Series, Model 960

   (2) American AVK Co., Model 24/50

   (3) James Jones Company, Model J-4006-C

4.07.13 Angle Plug Valves (Wharf Hydrants). Angles plug valves shall conform to the following:

1. The valves shall have a 2-inch or 4-inch screwed (I.P.T.) inlet riser.

2. Outlet nozzles shall be of the quantity and size specified on the plans. Threads shall be National Standard Hose Threads.

3. Hydrants shall be equipped with 1 ¾-inch pentagon spanner nuts on the operator stems and nozzle caps. Nozzle caps shall be constructed of cast iron.

4. Valves shall open counterclockwise.

5. Valve stems shall have conventional packing.

The following manufacturers have been approved by the Water Division:

(1) Clow Valve Company, Model 125 and Model 123

(2) James Jones Company, Catalog No. J-342 and J-344

4.07.14 Meter Boxes. Precast concrete meter boxes shall be provided for all ¾-inch through 2-inch water meters. Lids shall be concrete except where traffic covers are called for on the plans. Traffic covers shall be cast iron. The following manufacturers have been approved by the Water Division:

A. ¾-inch and 1-inch Meters

Manufacturer	Model
Brooks	No. 37 (Solid Concrete Cover)
Brooks	No. 37T (Cast Iron Traffic Cover)
Quikset	WA-20 (Solid Concrete Cover)
Quikset	WY-20 (Cast Iron Traffic Cover)

B. 1 1/2-inch and 2-inch Meters

Manufacturer	Model
Brooks	No. 65S (Concrete Cover with Reading Lid)
Brooks	No. 37T (Steel Traffic Cover with Reading Lid)
Quikset	WI-30 (Concrete Cover with Reading Lid)
Quikset	WY-30 (Steel Traffic Cover with Reading Lid)

4.07.15 Vaults and Covers. Vaults and covers shall conform to the following:

1. Sectional precast. Concrete vaults shall be provided for 3-inch and larger water meters and for fire services 4-inches and larger.

2. Breakaway webs shall be furnished in the size and location required for use as pipe slots. All joints shall be sealed with a Water Division approved sealer.

3. Cover plates shall be 3/8-inch thick diamond plate. All 4'x 8' vaults shall be constructed with four (4) tiers for 8-inch and 10-inch fire services and three (3) tiers for all 4-inch and 6-inch fire services and 3-inch, 4-inch and 6-inch water services. All 6'x 10' vaults shall use three (3) tiers. Covers shall be painted in accordance with Section 4.06.1, Painting Schedule.

4. Vaults shall be equipped with an adjustable cover in accordance with C.W.D. 800, 801 and/or 802.

5. Reinforcement steel shall be Grade 40 or Grade 60 billet steel conforming to ASTM A-615.

6. Cement, used in the construction of the vaults and manholes, shall be Type II. Concrete shall conform to ASTM C-150 and develop a minimum compressive strength of 3,000 psi at 28 days.

7. Vaults used in traffic areas, shall be designed for H20-S16 highway loads unless otherwise specified.

The following vaults have been approved by the Water Division:

Meter Size	Manufactures and Model
3-inch thru 6-inch Water Service	Brooks No. 848 w/sidewalk frame & cover
4-inch thru 10-inch Fire Service	Brooks No. 848 w/sidewalk frame & cover
8-inch Domestic Service	Brooks No. 8610 w/sidewalk frame & cover
10-inch Domestic Service	Quikset City of Riverside 8'x 10' vault per CWD-802

4.07.16 Service Saddles (Service Clamps). Saddles shall be constructed of bronze, double strap type, with a neoprene seal ring gasket. The following manufacturers have been approved by the Water Division:

(1) Mueller, Catalog No. H-16123, H-16126, H-16130, H-16134 and H-16137

(2) Rockwell, Catalog No. 323-0510 thru 323-1426

(3) R.H. Baker, Catalog No. 183-413 TAP thru 183-1426 TAP

(4) Jones, Catalog No. J-979

(5) McDonald, No. 3826

(6) Ford, No. 202B

4.07.17 Tapping Sleeves. Tapping sleeves shall be a ductile iron body construction with mechanical type joints on both sleeve ends and a Class 125 A.N.S.I. B16 flanged outlet or an ASTM A-276, Type 304 or 304L stainless steel body construction with full circumference gasket and flanged outlets meeting the requirements of Section 4.07.19, Flanges. Sleeves shall be equipped with a ½"-3/4" I.P.F. coupling or tap and corporation stop for pressure testing the sleeve. Sleeves shall be designed for a working pressure of 200 psi.

Sleeves shall be compatible with the tapping gate valves and tapping machines utilized for wet tapping the water main (see Section 4.07.4, Tapping Gate Valves).

The following manufacturers have been approved by the Water Department:

Stainless Steel Sleeve

A. Rockwell 662 or 663

B. Romac SST

C. Powerseal 3490-AS

Mechanical Type Joint

A. Mueller – Mechanical Joint Tapping Sleeve

B. Clow – Mechanical Joint Tapping Sleeve

C. Waterous – Mechanical Joint Tapping Sleeve

4.07.18 Flanges. All steel flanges shall be Class D Steel Hub Flanges conforming to A.W.W.A. C-207 and be of a slip-on welding pattern.

Ductile iron flanges shall conform to the requirements of A.W.W.A. C-115.

Flanges shall be either flat faced or have a serrated finish of approximately 32 serrations per inch, approximately 1/65-inch deep. Serrations may be spiral or concentric.

Plate or blind flanges shall have the flange faces machined flat, center drilled and tapped with 1-inch I.P.T., for 4-inch through 10-inch flanges and 2-inch I.P.T. for 12-inch and larger flanges. Flanges shall be furnished with a standard square head pipe plug.

For 1 ½-inch and 2-inch water service installations, a 2-inch brass screw meter flange shall be used. Brass screw meter flanges shall conform to Section 4.4 of A.W.W.A. C-701.

4.07.19 Flexible Couplings. Flexible couplings and flange coupling adapters shall conform to the following:

1. Each coupling shall consist of one steel or ductile iron middle ring, two steel or ductile iron followers, gaskets and sufficient numbers of steel bolts to compress the gasket without distorting the followers.

2. The thickness of the middle ring shall be such that the stress shall not exceed 50percent of the yield point when subjected to the hydrostatic test pressure of the pipeline. The middle ring thickness shall not be less than the thickness of the pipe wall of the joined pipe.

3. The middle rings shall be coated with a Water Division approved epoxy coating with a minimum dry film thickness of 10 mils. Follower rings shall be coated with a shop coat that a field coating will easily adhere to.

4. Bolts shall be 5/8-inch diameter carriage bolts with hexagon nuts. The steel used in the bolts shall have a minimum yield strength of 40,000 psi. The bolts shall be zinc plated or coated with a rust resistant finish meeting the requirements of A.W.W.A. C-111.

5. Gaskets for the couplings shall be composed of a crude or synthetic rubber base, suitable for use in potable water supply systems.
6. Adapter flange and follower on flanged couplings adapters shall be constructed of ductile iron, meeting or exceeding the requirements of ASTM A536, with flange bolt dimensions per A.W.W.A. C-207 for a Class D flange.

The following manufacturers and models have been approved by the Water Division:

A. Flexible Couplings
   (a) Baker Series 200
   (b) Dresser Style 38
   (c) Smith-Blair 411 & 441
   (d) Romac Style 501
   (e) Ford Style FC1 & FC2

B. Flanged Coupling Adapters

(a) Baker Series 601

(b) Ford Style FFCA

(c) Smith-Blair 912, 913 & 914

(d) Romac FCA 501

4.07.20 Joint Lubricant. Joint lubricant for use on cast iron and C.M.L.&C. steel pipe joints shall contain an effective preservative per U.S. Pharmacopoeia, 1975, 19th Edition. The supplier shall submit test reports from an independent laboratory for approval.

4.07.21 Polyethylene Encasement. Polyethylene encasement material shall have a minimum thickness of 8 mil and conform to Section 4.1 of A.W.W.A. C-105/A.N.S.I. A21.5.

4.07.22 Anode Ground Cells. Ground cells shall consist of two 1.4-inch square zinc bars, 60-inches long, separated by an insulating spacer in a prepackaged backfill mixture. The zinc bars shall conform to ASTM B-148, Type II. A six-foot long No. 4 AWG wire shall be connected to each anode core.

4.07.23 Concrete. Concrete for thrust blocks, anchors, pipe cradles, footings and encasements shall be Portland Cement concrete, Type II, 450-C-2000, unless otherwise specified.

4.07.24 Unfit or Rejected Material. All material shall be inspected for defects and conformity to the Specifications prior to and following installation. Any pipe, valve or appurtenance determined, by the Engineer, to be in conflict with these specifications, shall be rejected and immediately removed from the job site.

4.07.25 Material List and Drawings. The Contractor shall submit to the Engineer, for approval, an original list of material, which he proposes to install. The list shall contain the following:

A. Manufacturers name

B. Catalog number of unit

C. Model or series

D. Size

This list shall be supplemented by such other data as may be required, including detailed scale drawings, any non-standard special material and shall show any proposed deviation from the plans. When requested by the Water Division, the Contractor shall submit for approval sample articles of any material proposed for use. All such data shall be submitted in duplicate. After checking, correction and approval, not less than three complete sets shall be submitted to the Water Division. The Contractor shall be responsible for any material purchased, labor performed, or delay to the work prior to such approval.

The Contractor shall also furnish all literature and drawings, which are received with all equipment to be installed, and which pertain to the engineering, installation, operation and maintenance of that equipment.